

AYK REGION
YUKON STATE/FED REPORT #5

YUKON RIVER ANADROMOUS FISH INVESTIGATIONS
ANNUAL TECHNICAL REPORT, 1971

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April 1972

ABSTRACT

A summer chum salmon population estimate was conducted in the Yukon River during 1971 utilizing tag-recovery methods. Calculations based on a simple Peterson type estimate indicated an escapement past the tagging site of 894,426 chums and a total Yukon River run of 1,560,157 summer chum salmon for the period of June 22 to July 23.

The king and chum salmon runs were sampled at various locations for age, sex and size information. Age of the king salmon sample consisted of 3₂ (0.1%), 4₂ (4.6%), 5₂ (35.6%), 6₂ (58.9%) and 7₂ (0.8%) fish with a 1:1 sex ratio. The summer chum salmon catch sample was comprised of age 3₁ (0.5%), 4₁ (59.9%), 5₁ (39.5%) and 6₁ (0.1%) fish with a 1:1 sex ratio. The fall chum sample was represented by 3₁ (1.4%), 4₁ (96.9%) and 5₁ (1.7%) fish with a nearly 1:1 sex ratio. The overall mean length for fall chums was 5.1% greater than that of summer chum salmon.

Subsistence catches of chum salmon were below the previous 10 year total average. Aerial surveys were conducted on selected streams of the Yukon and Teslin river systems. Exploratory surveys located a suitable salmon counting tower site on the Anvik River. Future project emphasis will be directed toward monitoring escapement magnitude plus sex and age composition in tributary streams.

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INTRODUCTION

The Yukon River (Figures 1-4) receives large runs of king and chum salmon which are utilized for both commercial and subsistence purposes. Although the exact sizes of these salmon runs have not been determined, it is believed the Yukon River is the greatest single king and chum salmon producing system in Alaska.

Management of this valuable natural resource is based upon effective regulation of the fishery to allow for optimum escapement and harvest of the remaining run. To achieve effective management, accurate assessments of the total sizes of the salmon runs or indices of escapement and abundance need to be known. On the Yukon River, methods are presently under investigation to supply this valuable population data.

Estimates of the annual adult spawning runs can be calculated using tag and recovery data in conjunction with commercial and subsistence catch statistics. Daily indices of salmon abundance in the vicinity of the river mouth and prior to their arrival at the major fishing grounds can be determined by test fishing methods enabling a more flexible day to day management. Indices of escapements can be derived in selected spawning systems by systematic visual sample counts of migrating salmon which have passed through the fishery. Ensuing run sizes will in turn be appraised from parental run data. These advance estimates, even though tentative because of many variables, will enable more effective management through sound regulations.

During 1971, studies were conducted in the Yukon River system to determine the escapement or magnitude of the runs plus sex and age composition of various king and chum salmon stocks. Prior experiments revealed numerous problems associated with capturing suitable numbers of king salmon for tag-recovery studies resulting in a shift in emphasis of the investigations towards determining population estimates for chum salmon (Lebida, 1969, 1970). Additional investigations were designed to provide information on migration patterns and run timing.

This Annual Technical Report documents the various Yukon River anadromous fish projects conducted during the 1971 field season and is subject to revision before formal publication of any segment.

FIGURE 1. Yukon River map.

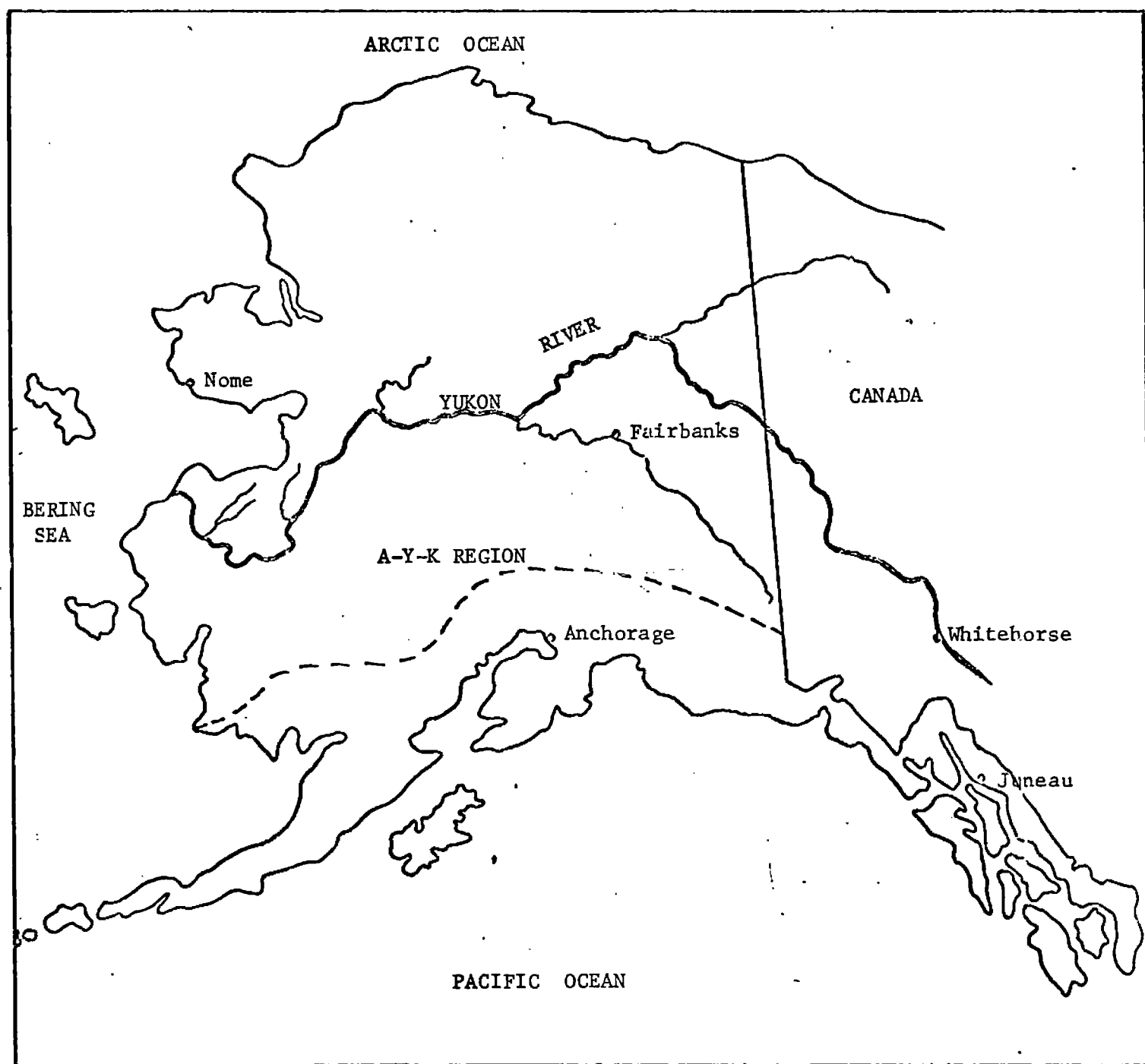


FIGURE 2. Lower Yukon River map.

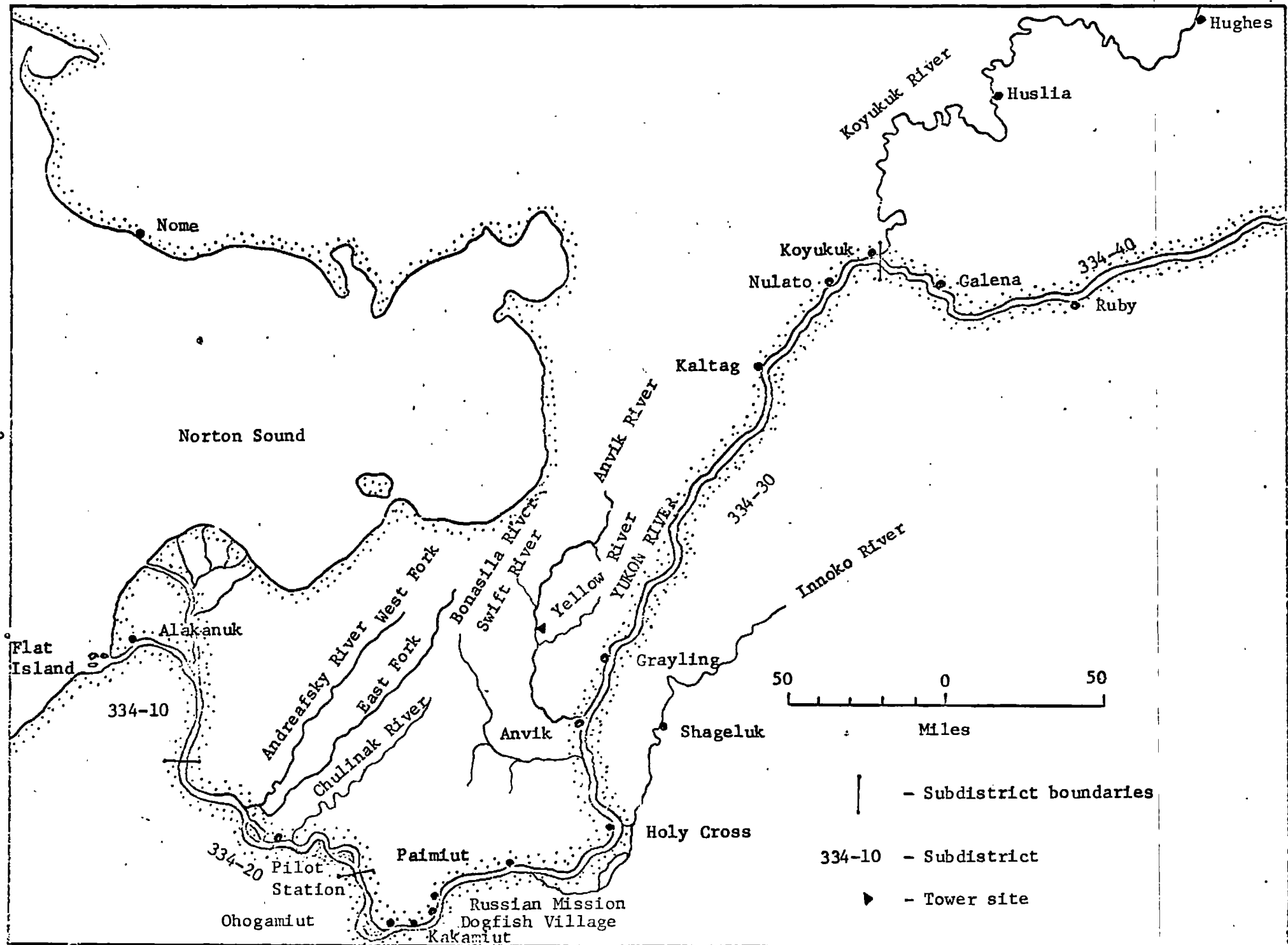


FIGURE 3. Mid-Yukon River map.

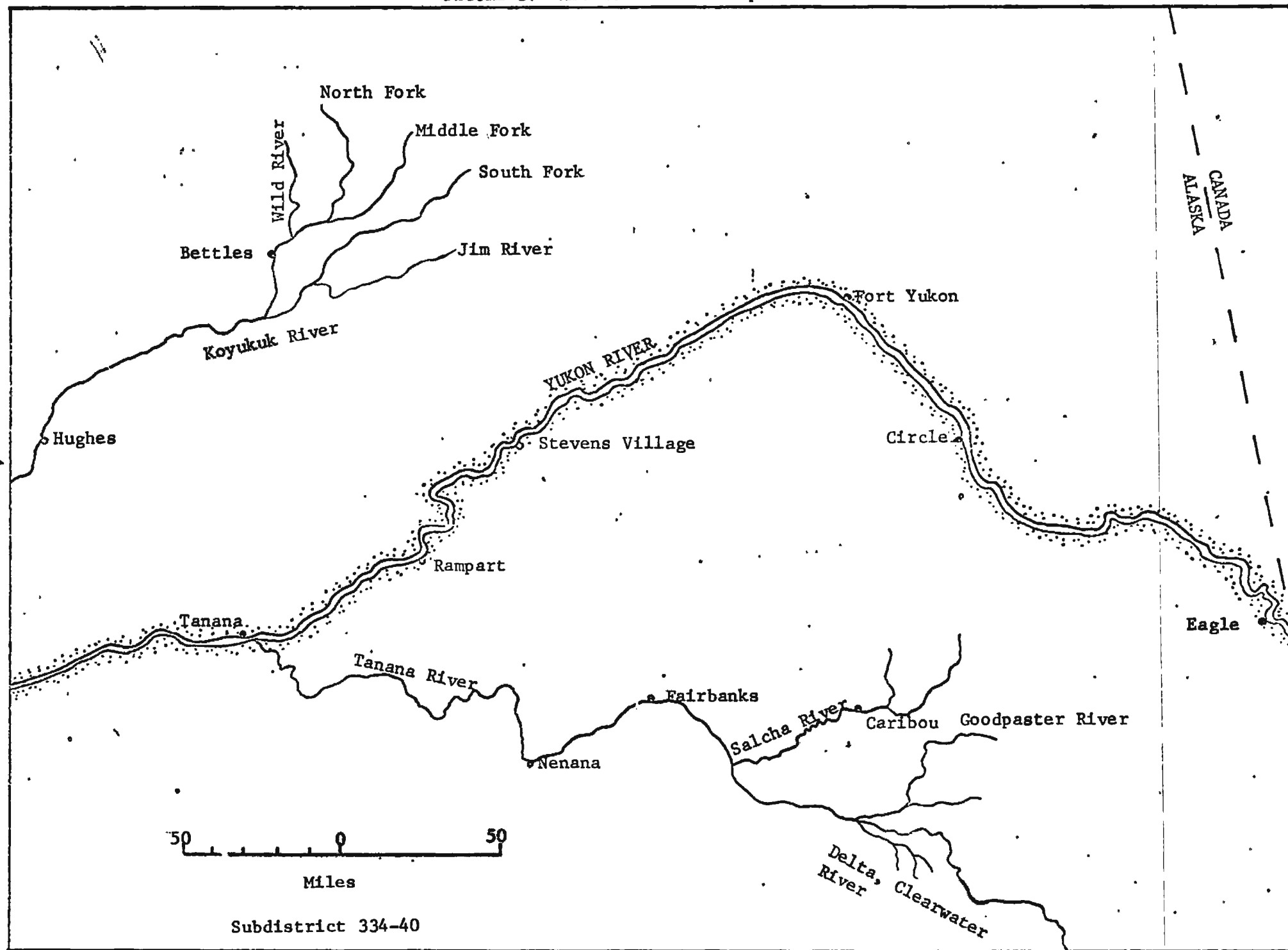


FIGURE 4. Upper Yukon River map.

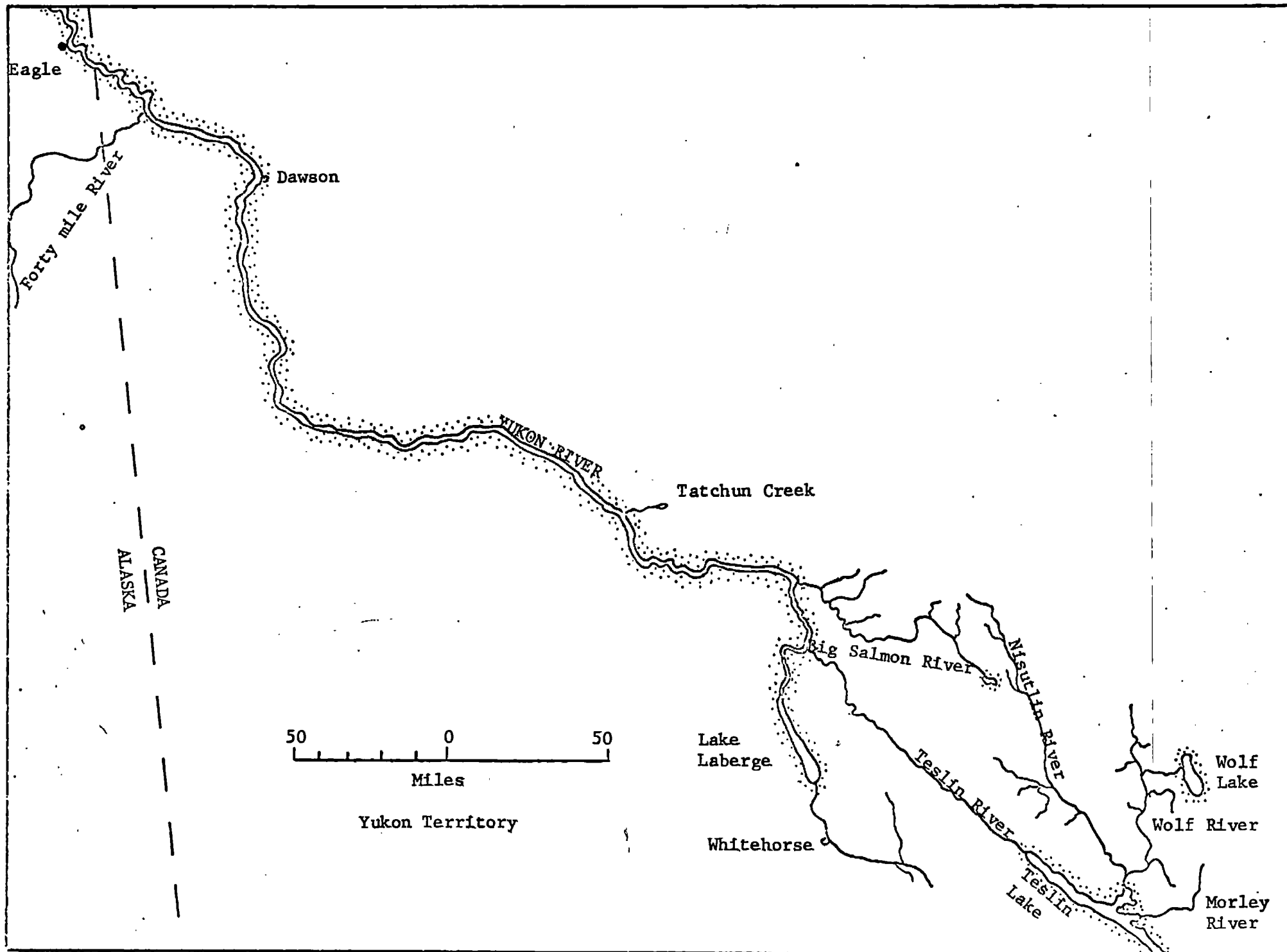


FIGURE 5. Fishwheel used to capture salmon, Ohogamiut, Yukon River, 1971.



METHODS AND MATERIALS

Fishing gear

Set gill nets of 5-1/2 and 8-1/2 inch stretched mesh nylon webbing with standard floats and weighted with a lead line were used to capture salmon. Each net was approximately 25 fathoms long by 3-1/2 fathoms deep. Nets were fished in areas of little current with one end attached to the river bank and the other end anchored offshore in deeper water.

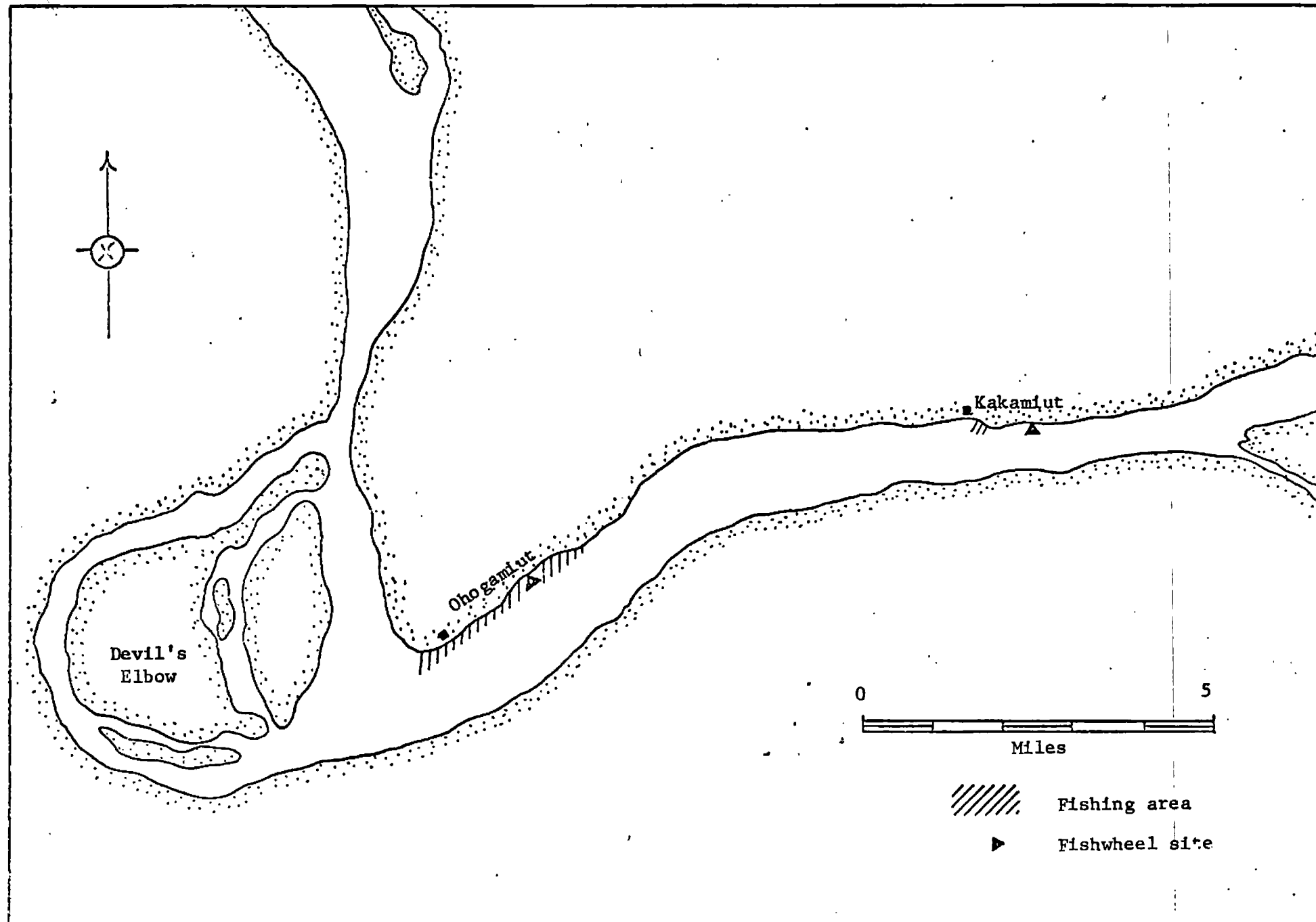
A fishwheel constructed of native spruce logs and cut lumber was fished for chum salmon (Figure 5). The fishwheel contained two baskets, each 10 feet long and 8 feet wide with a 4-foot deep scoop covered with 2-inch square mesh nylon webbing. Squares of plywood, 2 feet by 2 feet, were attached to the bottom outside edge of each basket as a means of increasing water resistance to speed up rotation of the wheel. Two plywood paddles, 8 feet by 2 feet, were installed at right angles to the baskets to assist in turning the wheel when rotation of the axle positioned both baskets out of the water. Adjustable axle supports allowed fishing depth to be increased or decreased with fluctuating water levels. The fishwheel was anchored to shore with a single 1/2 inch diameter wire rope. Two boom logs held the fishwheel offshore in the current. Fish leads were installed from the mid-section of the fishwheel platform to shore. The leads extended from the river bottom to just above the surface of the water. Rotation speed of the wheel ranged from 3 to 5 revolutions per minute. Baskets were adjusted to fish approximately 1 foot above the river bottom. Captured fish were automatically deposited into a live box by means of a simple chute attachment. Dip nets were used to remove fish from the live box.

Tagging

Tagging operations were conducted in an area within 2 miles upriver of the old village site of Ohogamiut (river mile 185) from June 22 to August 13. Tagging was done from a single fishwheel by a three-man crew. Gear was fished as continuous as possible and checked approximately every 3 hours to decrease fish mortality. The fishing site was located on the north bank of the river (Figure 6).

Chum salmon were tagged with Floy FD-68B international orange anchor tags using the Dennison tagging gun as an applicator. Approximately 1,200 yellow spaghetti tags of flexible 1/16 inch diameter plastic tubing in 13 inch lengths affixed to stainless steel needle applicators were also used to supplement the lack of anchor tags. Each tag was inscribed with a number

FIGURE 6. Ohogamiut tagging and Kakamiut recovery areas, Yukon River.



and the legend--REWARD ADFG ANCH.

All fish marked with anchor tags were tagged through the flesh just below and at the origin of the dorsal fin. Spaghetti tags were applied with a tagging needle pierced through both sides of the fish just beyond the insertion of the dorsal fin. After application, the needle was removed and the two free ends of the tag were tied tightly with an overhand knot. Floy tags were self anchoring after injection with the tagging gun. The outer half of the adipose fin of all tagged salmon was excised as a check against tag loss. A tagging cradle constructed of wood and canvas was used to hold the fish fairly immobile during the tagging operation.

For each tagged summer chum salmon, the date, tagging site, fishing gear and tag number were recorded. In addition to this information, the sex and length were recorded for each tagged fall chum and a scale sample removed. Regnart's (1962) criteria of later migration, silvery appearance and greater fork lengths were followed in distinguishing fall from summer chum salmon.

Tag recovery

Recovery operations were conducted approximately 1 mile above the Kakamiut area (river mile 193) by a three-man crew from June 24 to July 23. One fishwheel and a single gill net of 5-1/2 inch stretch mesh 25 fathoms long were used as capture gear. Fishing sites were located on the north bank of the river (Figure 6).

Fishing operations and procedures followed those outlined for the tagging site. All king salmon and not more than 30 chum salmon per day were sampled for age, sex and size information. Recovery operations were not conducted for fall chums.

Department biologists and subsistence survey crews also collected tag recoveries from fishermen within Alaska. Additional tags were returned by individuals through the mail. A survey crew collected tags from salmon carcasses in the Anvik River. A reward of \$1.00 was offered for each tag returned by fishermen. Tag and recovery data was utilized in a simple Peterson type estimate to calculate the 1971 adult summer chum salmon run.

Age, sex, size composition

Age, sex or size information was recorded for salmon sampled at

various project locations. Snout to fork of tail lengths for all fish were recorded in millimeters. Mid-eye to fork lengths were also recorded for king salmon sampled at Whitehorse and for all fall chums. Sex determination of live fish released unharmed was made on the basis of external morphology including snout, vent, body symmetry and occasional appearance of milt or eggs. Sacrificed fish were sexed internally by examination of the gonads.

Scale samples from all salmon were removed from the area of the first or second scale row above the lateral line on a diagonal down from the insertion of the dorsal fin to the origin of the anal fin. Scales were placed on gum cards and plastic impressions made in the laboratory. Scales were later interpreted for age using the Gilbert-Rich age designation.

For purposes of this report, a 42 salmon returning to spawn in 1971 would be the progeny of the 1967 run that migrated from freshwater to the ocean in the spring of 1969.

It has been impossible to determine whether a few king salmon scale samples (usually less than 10%) have one or two freshwater annuli. This cannot be resolved until adequate samples of smolt are obtained for age and size analysis. Fish with questionable two freshwater annuli were, therefore, arbitrarily assigned one freshwater annulus.

Escapement enumeration

Anvik River: A counting tower was constructed on the Anvik River, approximately 8 miles below the mouth of the Swift River, by a three-man crew on an experimental basis to evaluate its suitability in enumerating migrating chum and king salmon within this system (Figure 2). The tower consisted of a log platform suspended between two trees at a height of 36 feet above ground on a 10 foot high cutbank located on the west side of the river.

The average water depth at the counting tower site was 3 feet with a width of approximately 125 feet, however, 25 feet of the width was too shallow to allow fish passage under normal conditions. The flow rate in front of the tower was estimated at 3 miles per hour at low water. Flood-lamps strung across the river and powered by a gasoline generator were used to illuminate the river during hours of darkness.

Sample counts were made from the tower to test site suitability. A carcass survey was conducted by boat from the mouth of the Swift River to

the village of Anvik to recover tags and survey salmon species composition, specifically to determine if a significant pink salmon population utilized the system for spawning.

Big Salmon River: A counting tower site was to be established on the Big Salmon River in the Yukon Territory, Canada, to enumerate the king salmon spawning escapement for the system. However, the project was determined unfeasible in 1971 due to high and turbid water conditions which made visual observance of migrating salmon nearly impossible.

Whitehorse Dam: A Department employee enumerated and sampled king salmon passing through the Whitehorse dam fishway from July 26 to September 1. Canadian Department of Fisheries personnel continued salmon enumeration through September 4. Daily records were kept of all kings utilizing the fishladder. Approximately 43% of the run was sampled for age, sex and size information and then released unharmed. A dip net was used to capture salmon out of the fishway. An aerial survey of the major king salmon spawning systems was conducted in the Yukon Territory on August 31 utilizing a float equipped, STOL conversion Cessna 185 aircraft.

Test fishing

Test fish gill nets of 8-1/2 and 5-1/2 inch stretch mesh were fished near Flat Island in the mouth of the Yukon River (Figure 7) from June 13 to July 15 by a three-man crew to determine abundance and run timing of king and chum salmon. All fish were sampled for age and sex structure.

Subsistence catch tabulation

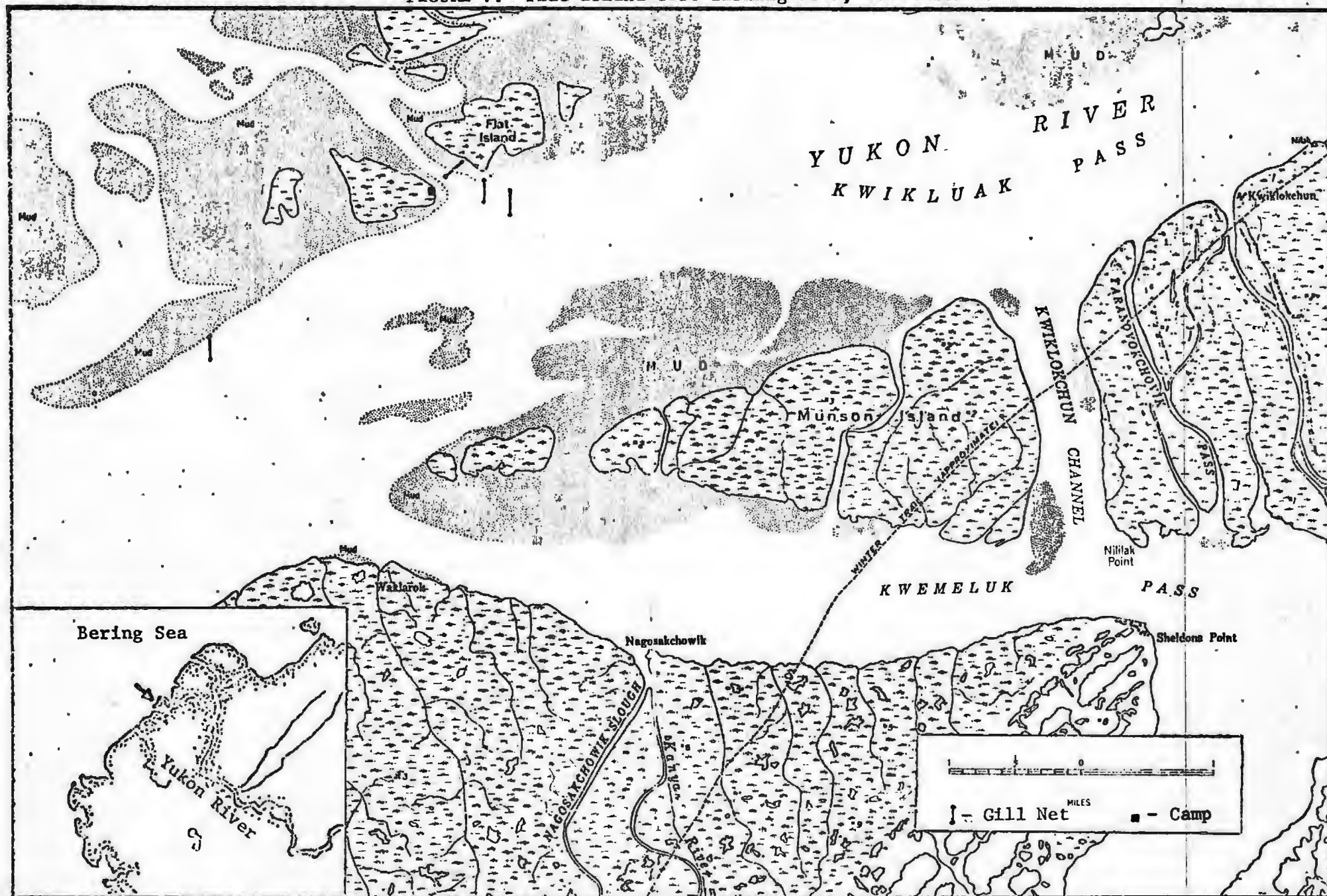
Much of the subsistence fishing information was obtained from personal interviews of fishermen and direct counts of salmon. Some catches were obtained by return of special catch forms or questionnaires distributed to fishermen prior to the fishing season. Two-man crews, traveling by boat, surveyed the majority of the Yukon River subsistence fishery. Biologists traveling in a single engine aircraft surveyed the remaining subsistence fishery. The Whitehorse office of the Canadian Department of Fisheries supplied catch information for the Canadian portion of the Yukon drainage.

RESULTS

Tagging-Recovery

A total of 6,383 summer and 485 fall chum salmon was captured with

FIGURE 7. Flat Island test fishing area, Yukon River.



the Ohogamiut fishwheel and all except 230 summer chums were tagged and released. Only fish in good condition were marked. Data are summarized in Table 1.

Summer chums: Overall tag recovery totaled 131 (2.1%). All recoveries were made within the Alaska portion of the Yukon River. The greatest number (30) of recoveries occurred in the Anvik area. Recoveries below the tagging site were considerably below the 50.8 and 14.0 percent experienced during 1969 and 1970 respectively. This was due to improved live boxes, shorter holding and handling periods plus use of easier applied and less injurious Floy anchor tags in place of spaghetti tags (Lebida 1969, 1970). The Kakamiut recovery site accounted for 20 recaptures. Tag losses were evidenced on three fish. The furthest recovery ever recorded was made in the Tanana River at Nenana, a distance of 1,045 miles upstream from the mouth of the Yukon River (Figure 3). The mean migration rate of recovered fish above the tagging site was 11.1 miles per day. The number and percentage distribution of summer chum salmon tag recoveries in addition to migration rate data by recovery area are presented in Table 2.

Fall chums: Recovered tags totaled 17 (3.5%). The greatest number (3) of recoveries occurred in the Anvik area. The furthest recapture was made at Rampart, a distance of 948 river miles from the mouth of the Yukon. The mean migration rate of recovered fish above the tagging site was 21.1 miles per day. The number and percentage distribution of fall chum salmon tag recoveries by recovery area are summarized in Table 3.

Total chums: The overall tag recovery for summer and fall chum salmon was 148 (2.2%) fish. This is the lowest recovery rate ever recorded for 5 years of tag-recovery efforts (Table 4).

Population estimate: A population estimate of summer chum salmon passing through the tagging area was calculated with a simple Peterson type estimate based on tag-recovery methods utilizing fishwheels (Appendix A). Only tags applied at Ohogamiut and recoveries made at Kakamiut were utilized in the estimate. Results indicated an escapement estimate of 894,426 chums past the tagging site and a total run estimate of 1,560,157 summer chum salmon for the period of June 22 to July 23.

Age, sex, size composition

Summer chum salmon: A total of 1,618 summer chum salmon was sampled for age and sex information throughout the run at various locations (Appendix B). For the entire sample, 3₁, 4₁, 5₁ and 6₁ age groups were

Table 1. Chum salmon tag-recovery summary, Ohogamiut, Yukon River, 1971.

Run	Date	Fishwheel effort (hours)	Captured		Tagged		Recovered		Percent of total
			Number	Percent of total	Number	Percent of total	Number	Percent	
Summer	6/22-7/27	1,243	6,383	92.9	6,153	92.7	131	2.1	88.5
Fall	7/27-8/13	<u>420</u>	<u>485</u>	<u>7.1</u>	<u>485</u>	<u>7.3</u>	<u>17</u>	<u>3.5</u>	<u>11.5</u>
Total	6/22-8/13	1,663	6,868	100.0	6,638	100.0	148	2.2	100.0

Table 2. Distribution and migration rates of tagged summer chum salmon, Yukon River, June 22-August 12, 1971.

Recovery area	Subsistence catch	Miles from tagging site	Recoveries			Tagging dates (range)	Recovery dates (range)	Mean days out	Mean miles per day
			No.	%	% of subsistence catch				
Below Ohogamiut	---	---	11	8.4	--	7/4-28	7/7-8/8	--	--
Kakamiut ^{1/}	---	8	20	15.3	--	6/27-7/21	6/28-7/21	1.8	6.7
Russian Mission	2,378	28	9	6.9	0.4	7/15-29	7/?-30	4.0	7.0
Paimiut and		66	8	6.1		7/4-17	7/8-20	3.0	22.0
Holy Cross	2,203	94	1	0.8	0.4	7/21	7/?	?	?
Anvik	7,309	132	30	22.9	0.4	7/1-8/2	7/6-8/25	15.3	8.6
Anvik River ^{2/}	---	132+	8	6.1	--	7/6-17	7/28-31	--	--
Shageluk (Innoko R.)	---	143	1	0.8	--	7/18	7/28	10.0	14.3
Grayling	6,537	151	21	16.0	0.3	6/28-7/24	7/6-8/10	12.1	12.5
Rapids Creek and		160	1	0.8		7/18	8/7	20.0	8.0
Kaltag	9,133	265	5	3.8	0.07	6/30-7/5	7/19-8/4	24.2	11.0
Nulato	16,337	299	13	9.9	0.08	6/27-7/19	7/?-8/?	25.0	12.0
Bishop Rock	3,125	317	2	1.5	0.06	7/14-8/2	7/18-8/17	?	?
(Koyukuk)									
Nenana	19,368	860	1	0.8	0.005	7/12	?	?	?
(Tanana R.)									
Totals			131	100.1		6/27-8/2	6/28-8/25	12.8	11.1

^{1/} Department recovery site.

^{2/} Department carcass survey recoveries.

Table 3. Distribution and migration rates of tagged fall chum salmon, Yukon River, July 27-August 13, 1971.

Area of recovery	Miles from tagging site	Recoveries		Tagging dates	Recovery dates	Mean days out	Mean miles per day
		No.	Percent				
Below Ohogamiut	--	5	29.4	7/30; 8/2; 8/6; 8/6; 8/9	8/3; 8/16; ?; 8/11; 8/21	--	--
Russian Mission	28	1	5.9	8/8	?	?	?
Paimiut	66	1	5.9	8/8	8/?	?	?
Anvik	132	3	17.6	7/28; 8/5; 8/13	8/12; 8/15; 8/21	11	12.0
Grayling	151	2	11.7	7/27; 8/6	7/?; 8/12	?	?
Kaltag	265	1	5.9	8/8	8/26	18	14.7
Nulato	299	1	5.9	8/7	8/25	18	16.6
Bishop Rock (Koyukuk)	320	1	5.9	8/4	8/15	11	24.4
Tanana	695	1	5.9	7/27	8/18	22	31.6
Rampart	763	<u>1</u>	<u>5.9</u>	<u>8/6</u>	<u>9/3</u>	<u>28</u>	<u>27.2</u>
Totals		17	100.0	7/27-8/13	7/?-8/21	18.0	21.1

Table 4. Chum salmon subsistence catches^{1/} and tag-recovery data^{2/}, Yukon River, 1963; 1968-1971.

Date	Tagging location	Number tagged	Number recovered	Percent recovered	Catch above tagging site
1963	Pilot Station	1,060	287	27.1	421,625
1968	Ohogamiut Dogfish Village Paimiut	591	45	7.6	189,607
1969	Ohogamiut	1,508	104	6.9	213,725
1970	Ohogamiut	3,049	129	4.2	223,237
1971	Ohogamiut	6,638	117 ^{3/}	1.8 ^{3/}	198,671

^{1/} Regnart et al, 1970.

^{2/} Goiger et al, 1968; Lebida 1969, 1970.

^{3/} Department recoveries (31) not included. Total recoveries--148 (2.2%).

represented with 4₁ (59.9%) fish most abundant for both sexes.

The age, sex and size composition of summer chum salmon sampled at Kakamiut are presented in Table 5 as comparative data with that of fall chums captured in the same area. Summer chums in this sub-sample were represented by the 4₁ and 5₁ age groups with more 5₁ males and more 4₁ females. The sex ratio was 2:1 in favor of females.

Fall chum salmon: The age, sex and size composition of fall chum salmon sampled at Ohogamiut are presented in Table 6. Fall chums were represented by 3₁, 4₁ and 5₁ fish with sex ratios nearly equal. The 4₁ age group comprised 96.9 percent of the sample. Mean lengths were longer than summer chums in all age groups for both sexes of fall chums. Overall mean length for fall chums was 5.1% greater than that of summer chum salmon.

King salmon: A total of 2,714 king salmon was sampled for age and sex information throughout the run at various locations with varied gear (Appendix C). The overall sex ratio was nearly equal for the entire sample. Males were most abundant in all age groups except for age 6₂ fish. Data indicated fishwheels to be selective for the younger age groups.

At Whitehorse, 371 king salmon were sampled for age, sex and size composition. Based on 271 readable scales, males were most abundant in the 5₂ age group (33.2%) while females dominated the 6₂ age group (41.0%). A 1.0:1.1 sex ratio in favor of females was evidenced. Data are presented in Appendix C. A conversion table for mid-eye to snout to fork length for male and female king salmon captured at river mile 1,745 (Whitehorse) was calculated using linear regression methods (Appendix D).

Escapement enumeration

Anvik River: Exploratory surveys conducted during early July located a suitable salmon counting tower site on the Anvik River. Lateness of the season plus rising, turbid waters (the result of heavy rains) precluded any significant counting. A preliminary count conducted on July 24 during the hours of 1600-2200 indicated 300 chum and 5 king salmon per hour were migrating past the tower.

During the period of July 27-29, a salmon carcass survey was conducted by boat from the mouth of the Swift River to the village of Anvik. A total of 2,673 chum carcasses was enumerated. Of these, 493 were accounted for between the mouth of the Swift River and the tower site on July 27. On July 28, 1,715 carcasses were counted between the tower site and the mouth

Table 5. Age, sex and size composition of summer chum salmon taken with a fishwheel at Kakamiut, Yukon River, 1971.

	<u>Age group</u>			
	<u>3₁</u>	<u>4₁</u>	<u>5₁</u>	<u>Total</u>
<u>Males</u>				
Number	--	37	79	116
Percent	--	9.8	20.8	30.6
Mean length (mm) <u>1/</u>	--	567	608	595
<u>Females</u>				
Number	--	153	110	263
Percent	--	40.4	29.0	69.4
Mean length (mm)	--	537	576	553
<u>Combined sexes</u>				
Number	--	190	189	379
Percent	--	50.2	49.8	100.0
Mean length (mm)	--	543	589	566

^{1/} Snout to fork of tail.

Table 6. Age, sex and size composition of fall chum salmon taken with a fishwheel at Ohogamiut, Yukon River, 1971.

	Age group			Total
	3 ₁	4 ₁	5 ₁	
<u>Males</u>				
Number	2	167	4	173
Percent	0.6	46.8	1.1	48.5
Mean length (mm) <u>1/</u>	545	615	643	615
<u>Females</u>				
Number	3	179	2	184
Percent	0.8	50.1	0.6	51.5
Mean length (mm)	552	577	606	577
<u>Combined sexes</u>				
Number	5	346	6	357
Percent	1.4	96.9	1.7	100.0
Mean length (mm)	549	595	631	595

^{1/} Snout to fork of tail.

of the Yellow River. During July 29, 465 carcasses were accounted for from 15 miles above Anvik to the village proper. The survey recovered eight tags from summer chums resulting in a tagged:untagged ratio of 334:1. Of the eight recoveries, three occurred between the tower site and the mouth of Yellow River with the remaining five recovered above the village of Anvik. Tag loss was evidenced on two carcasses. Salmon carcasses of other species were not observed.

Whitehorse Dam: At the Whitehorse Dam fishway, a total of 856 king salmon was enumerated through the fishway from August 7 to September 4 (Appendix E). This was the largest escapement passing over the dam since 1965 (Appendix F).

Aerial surveys: Approximately 30 hours were spent conducting aerial surveys of salmon spawning streams in the Yukon Area during 1971. Selected streams of the Yukon and Teslin River system were surveyed. Results are summarized in Table 7. Index stream comparative estimates for the years 1959 to 1971 are presented in Appendix F.

Test fishing

Chum salmon: Chum salmon test fishing catches made at Flat Island and Ohogamiut are compared in Figure 8. The first recorded fish was captured June 14 at Flat Island. Notable peaks of abundance occurred July 11 at Flat Island and July 17 at Ohogamiut. Based on these catch data, the migration rate of untagged chum salmon in the lower 185 miles of the river was 31.0 miles per day. Catch data are presented in Appendices G and H. Ohogamiut and Kakamiut run timing was essentially similar with only 8 miles separating the two sites (Appendices H and I).

King salmon: King salmon catch data recorded at Flat Island and Ohogamiut, plus Whitehorse escapement data, are compared in Figures 9 and 10 with catch data presented in Appendices G, J and Whitehorse data in Appendix E. The first recorded fish was captured June 13 at Flat Island. Abundance peaks at Flat Island reflect the tidal influence on salmon entry into the river. Ohogamiut data is based on a relatively small sample obtained from a single gill net and is not considered entirely valid or reliable. Of 856 kings that utilized the Whitehorse Dam fishway, the majority of fish passed through the facility on August 17.

Subsistence catch tabulation

A minimum of 24,916 king salmon and 198,671 salmon of other species

Table 7. Aerial survey salmon escapement estimates, Yukon Area, 1971.

Stream	Date	Survey rating	Kings	Cohos	Chums
Andreafsky River					
West Fork	8/1	Fair	1,284	--	71,745
East Fork	8/1	Fair	<u>1,904</u>	--	<u>98,095</u>
Total			3,188		169,840
Chulinak River	8/1	Poor ^{1/}	137	--	8,265
Stuyahok River (Bonasila R.)	7/27	Poor	--	--	3,145
Hawk River (Bonasila R.)	7/27	Poor	--	--	600
Salcha River (Tanana R.)	8/9	Poor ^{1/}	158	--	39
	9/27	Fair	--	--	306 ^{2/}
Clearwater Creek (Tanana R.)	9/27	Good	--	135	202
	10/20-21	Good	--	3,000 ^{3/}	--
Koyukuk River					
South Fork	8/11	Fair	179	--	6,950
Middle Fork	8/11-12	Fair	37	--	50
North Fork	8/12	Fair	7	--	--
Jim River (Koyukuk R.)	8/11	Fair	51	--	--
Tatchun Creek ^{4/}	8/31	Good ^{1/}	130	--	--
Big Salmon River ^{4;6/}	8/25 ^{5/}	Poor	200	--	--
	8/31	Fair ^{1/}	97	--	--
Nisutlin River ^{4;6/}	8/25 ^{5/}	Good	640	--	--
	8/31	Fair	51	--	--

- ^{1/} Incomplete survey of spawning area.
^{2/} Carcasses.
^{3/} Division of Sport Fish aerial and ground counts.
^{4/} Yukon Territory, Canada.
^{5/} Canadian Department of Fisheries survey.
^{6/} Index area.

FIGURE 8. Chum salmon catch per unit effort at Flat Island and Ohogamiut, Yukon River, 1971.

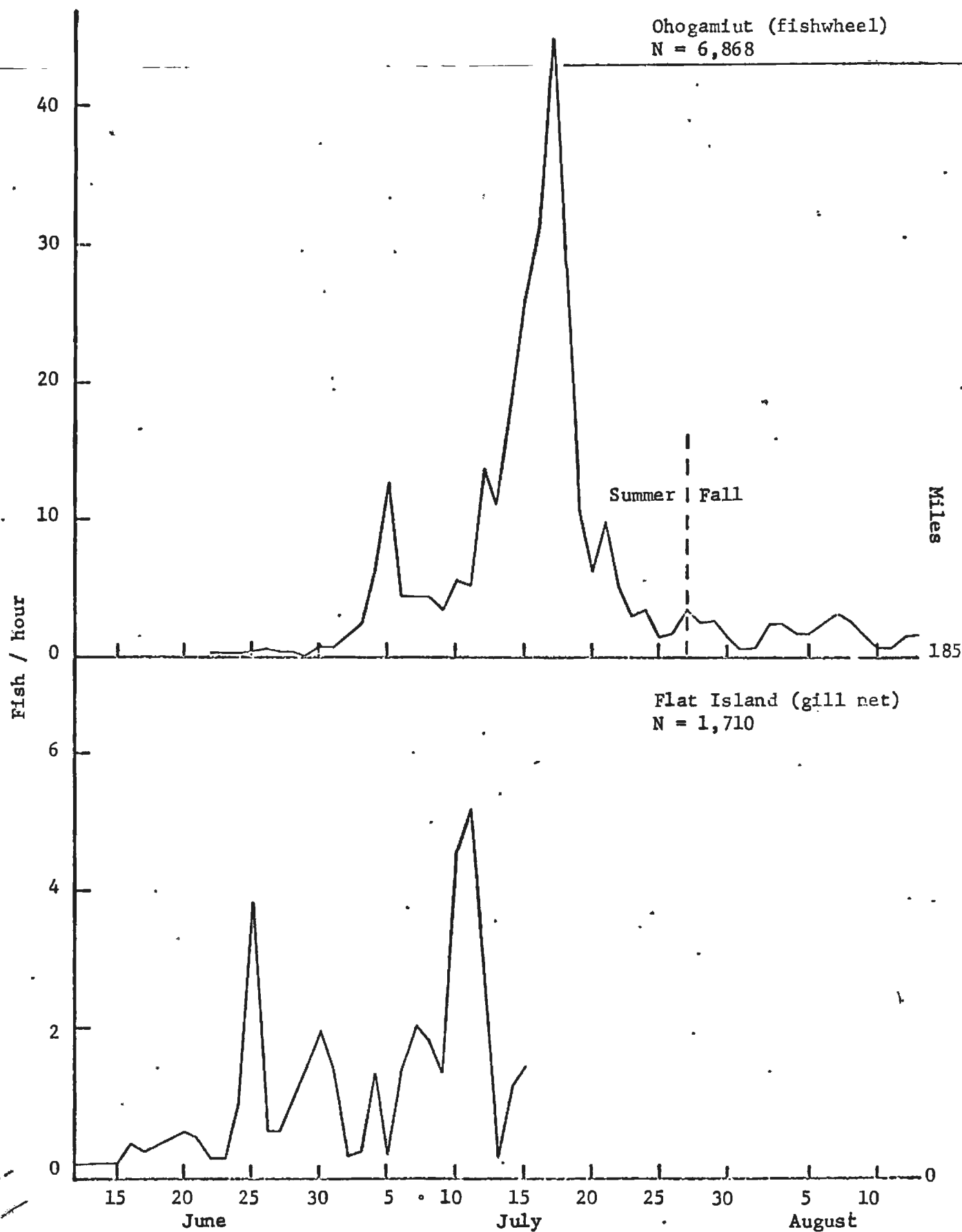


FIGURE 9. King salmon catch per unit effort at Flat Island and Ohogamiut, Yukon River, 1971.

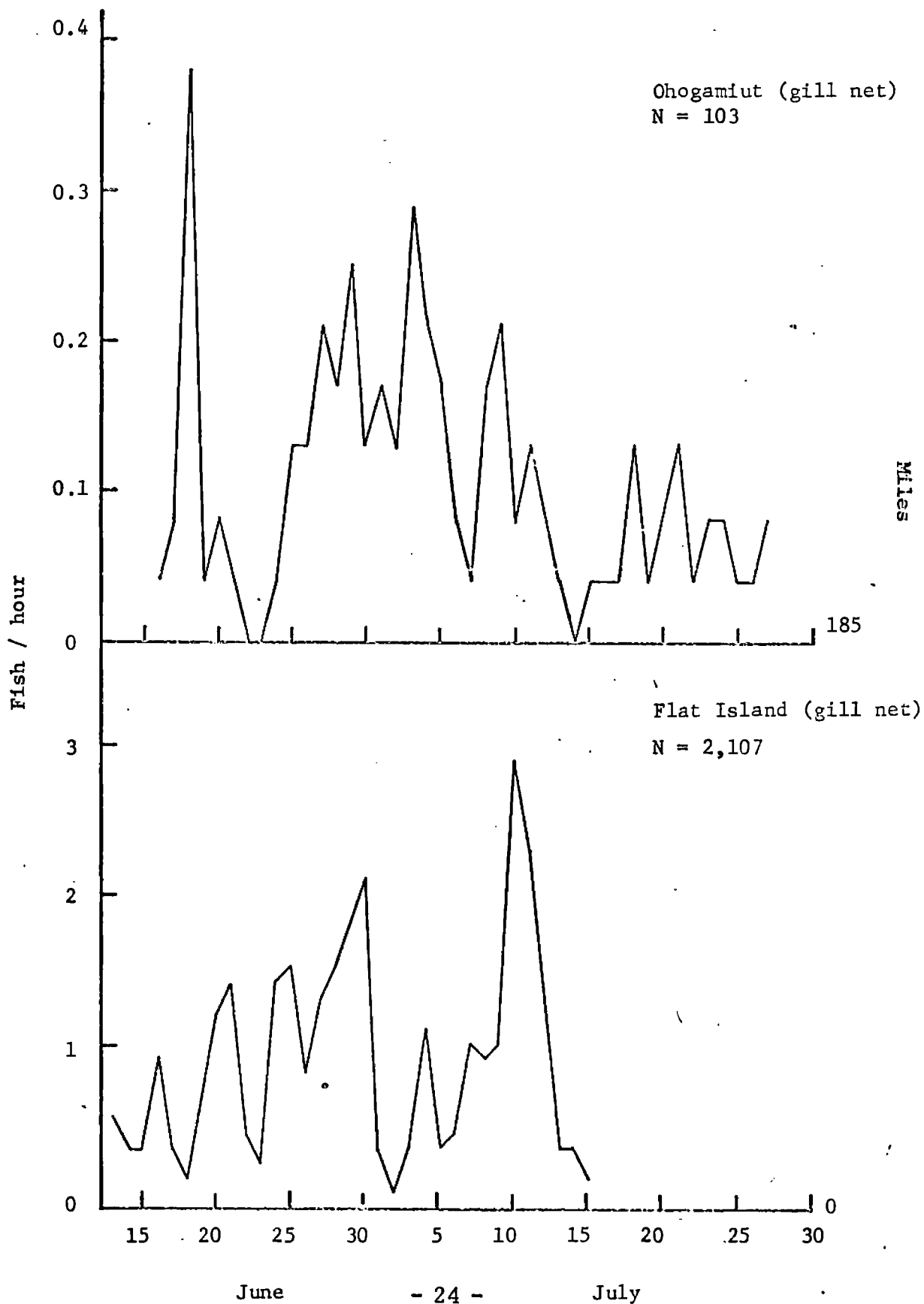
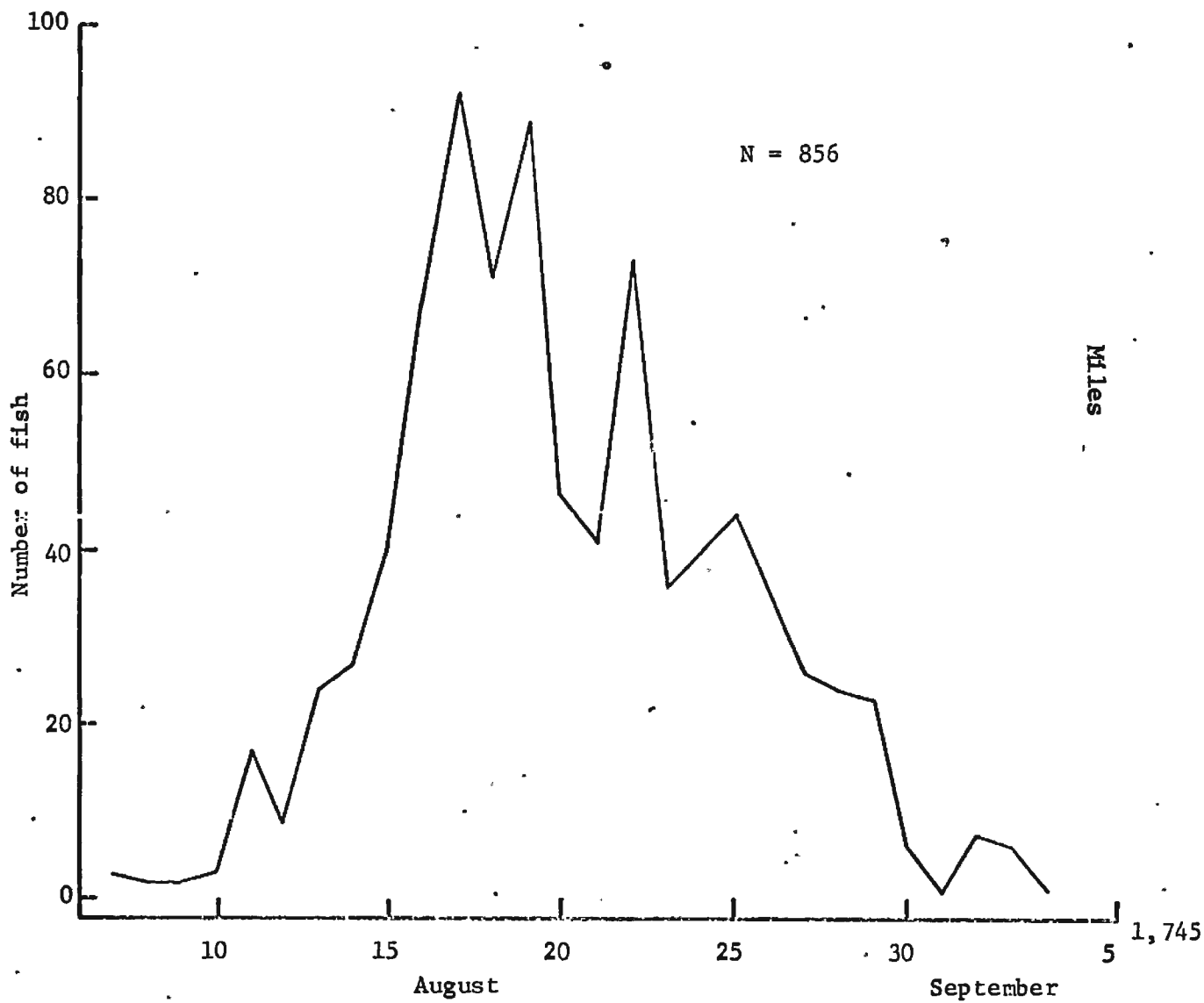


FIGURE 10. King salmon escapement utilizing the Whitehorse Dam fishway, Y.T., Yukon River, 1971.



was taken in the Yukon Area subsistence fishery during 1971. The previous 10 year average of king and chum salmon subsistence catches was 19,877 and 326,994 fish respectively. The recorded subsistence catches represent minimum figures as salmon consumed prior to the surveys and catches made after the completion of surveys are not always recorded. Subsistence harvest data for the years 1961 to 1971 are presented in Appendix K.

DISCUSSION

Suitable numbers of chum salmon were easily captured with fishwheels for tag-recovery studies. Modification of the fishwheels from three basket into smaller two basket models with paddles improved fishing success. Contributing factors to catch efficiency were increased rotation speed due to reduced overall basket weight and a resulting decrease in required maintenance. Use of much smaller wheels for capturing chum salmon is recommended.

Although a population estimate utilizing tag-recovery methods was arrived at for summer chum salmon, the estimate is not considered entirely valid. Many inherent problems made it difficult to completely satisfy Ricker's (1948) assumptions fundamental to a valid population estimate. Data indicated the highest occurrence (0.4%) of tag recoveries, as compared to subsistence catches, occurred in the Holy Cross and Anvik areas. On the basis of this information, assumptions are that the majority of fish tagged may be spawning in the Anvik River. Random tagging, therefore, may not have occurred as fish destined for other systems were probably not proportionately marked. Ideally, tag-recovery operations should occur on both sides of the river to verify random tagging and distribution of fish. This is difficult, if not impossible, in the lower Yukon River tagging area. Eroding river banks, swift currents, shallow water, sand bars and debris preclude any successful attempts of fishing gear on the south bank. Nearly all upriver commercial and subsistence fishing gear is operated along the northern river bank.

Based on subsistence catches, data exhibited two percentage ranges of tagged to untagged fish in the harvests. These recovery percentages were high (0.4-0.3%) from Russian Mission to Grayling and were significantly lower (0.06-0.005%) upriver from Grayling. Indications are that a very low proportion of fish spawning in upriver systems was tagged. These fish, therefore, may not be migrating close to the northern river bank as demonstrated by the extremely low Tanana River catch data. For example, fish destined for the Tanana River, which enters the Yukon from the south, may be homing on Tanana waters evidently flowing along the south bank of the Yukon. Mixing of both river waters may not occur to the extent of masking a specific upriver migra-

tion route. Based on a small number of fish, tagging studies did indicate fall chums to be evenly distributed throughout the spawning system and migration routes.

✓ A general decline in subsistence fishing has also brought about a decline in tag recovery rates. During 1963, approximately 420,000 chum salmon were caught for subsistence purposes and 27.1% of the tagged fish were recovered. In 1971, nearly 200,000 chums were harvested by subsistence fishermen and only 1.8% of the tags were recovered.

Increased welfare payments and more employment opportunities have resulted in the steady decline in subsistence fishing effort throughout the Yukon area. Snow vehicles are also replacing sled dogs and this is speeding up the decline of the subsistence fishery as most of the chum catches are used for dog food. However, based on progressing trends, an increased commercial harvest in the lower river is offsetting the decline in the upriver subsistence catch.

Enumerating migrating salmon in the Anvik River appears feasible. Weather and related river conditions seem to be the only limiting factors. Improvements needed are the addition of a light-colored underwater background panel to insure adequate contrast between the fish and bottom under all reasonable weather and water conditions. In addition, flood lights extended across the entire width of the river will be needed to provide illumination during hours of darkness.

The 1971 Whitehorse data exhibited a favorable king salmon escapement sex ratio of 1:1 as compared to a sex ratio of 7:1 in favor of males during 1970 (Lebida 1970). A combination of over selection of older aged kings (more female 62's) in the downriver fishery plus an unusually large return of 42 and 52 king salmon (chiefly males) produced the skewed sex ratio in 1970. In combination with these factors, it is believed that a preponderance of males often exists naturally in most spawning runs due to an earlier age of maturity attained by many males. Age composition of the runs can also be expected to vary from year to year because of differences in the survival and return of various brood year stocks.

During 1972, all major tag-recovery efforts will be phased out with emphasis directed toward monitoring escapement age, sex and size composition plus magnitude in tributary streams by use of counting towers and eventually weirs. New systems and methods will also be evaluated.

SUMMARY

Tagging-Recovery

1. Of 6,383 summer and 485 fall chum salmon captured, 6,153 (96.4%) summer and 485 (100.0%) fall chums were tagged and released.
2. Overall tag recovery totaled 148 (2.2%).
3. The greatest number (41) of recoveries occurred in the Anvik area. The furthest summer chum salmon recovery was made in the Tanana River at Nenana, a distance of 1,045 miles upstream from the mouth of the Yukon. The furthest fall chum recovery occurred at Rampart, a distance of 948 river miles from the mouth of the Yukon.
4. The mean migration rate of tagged summer and fall chums was 11.0 and 21.1 miles per day respectively.
5. The first recorded summer chum salmon was captured June 14 at Flat Island. A peak catch occurred on July 17 in the Ohogamiut area.
6. A summer chum salmon population estimate was calculated based on a simple Peterson type estimate. Results indicated an escapement estimate of 894,426 chums passed the tagging site and a total run estimate of 1,560,157 summer chum salmon for the period of June 22 to July 23. Reliability of results is questionable.

Age, sex, size composition

1. The sampled summer chum salmon run was represented by the 3₁, 4₁, 5₁ and 6₁ age groups with age 4₁ fish representing 59.9 percent of the entire sample.
2. The overall mean length for fall chums was 5.1% greater than that of summer chum salmon. Age 4₁ fish comprised 96.9% of the fall chum sample.
3. Age and sex data from various locations indicated the king salmon run had a nearly equal sex ratio with females most abundant in the 6₂ age group.

Escapement enumeration

1. Exploratory surveys located a suitable counting tower site on the Anvik River.

2. Preliminary counts were conducted of salmon passing the Anvik River tower.
3. Carcass surveys in the Anvik River accounted for 2,673 summer chum salmon and eight tag recoveries.
4. A total of 856 king salmon was enumerated through the Whitehorse Dam fishway with 371 fish sampled for age, sex and size composition.
5. Selected streams of the Yukon and Teslin River systems were surveyed.

Test fishing

1. The first recorded chum and king salmon were captured June 14 and 13 respectively at Flat Island.
2. Salmon run timing and abundance was monitored at various locations on the Yukon River.

Subsistence catch tabulation

1. A minimum of 24,916 king salmon and 198,671 salmon of other species were taken in the Yukon Area subsistence fishery.
2. Subsistence catches are decreasing as a result of a decline in effort.

ACKNOWLEDGEMENT

This project was financed in part with Anadromous Fish Act (P.L. 89-304) funds through the National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce. The Canadian Department of Fisheries kindly allowed for our participation in stream surveys and fish sampling in the Yukon Territory. Special thanks is extended to Mr. John Summers, District Protection Officer at Whitehorse, for providing valuable assistance with all phases of our Canadian studies.

LITERATURE CITED

Geiger, M., R. Regnart, R. Baxter and C. Yanagawa. 1968. Arctic-Yukon-Kuskokwim area anadromous fish investigations. Annual Technical Report, Anadromous Fish Project (AFC-7-2). Alaska Department of Fish and Game, 113 p.

Lebida, R.C. 1969. Arctic-Yukon-Kuskokwim area anadromous fish investigations. Annual Technical Report. Anadromous Fish Project (AFC-7-3). Alaska Department of Fish and Game, 77 p.

_____. 1970. Yukon River anadromous fish investigations. Annual Technical Report. Anadromous Fish Project (AFC-7). Alaska Department of Fish and Game, 41 p.

Regnart, R. 1962. Yukon tagging program. Final Report. (Contract No. 14-17-0007-22). Alaska Department of Fish and Game.

_____, R. Baxter, C. Yanagawa and C. Hurd. 1970. Arctic-Yukon-Kuskokwim area annual management report. Alaska Department of Fish and Game, 171 p.

_____, _____, _____, _____. 1971. Arctic-Yukon-Kuskokwim Region annual management report. Alaska Department of Fish and Game, (in press).

Ricker, W.E. 1948. Methods of estimating vital statistics of fish populations, University of Indiana Publ., Sci., Ser., No. 15, 101 p.

APPENDIX

APPENDIX A

Summer chum salmon population estimate data^{1/} and calculations, Yukon River,
June 22-July 23, 1971.

<u>Subdistrict</u>	<u>Commercial catch</u>	<u>Subsistence catch</u>	<u>Total</u>
334-10	282,045	17,890	299,935
334-20	6,096	28,711	34,807
334-30	50	47,022	47,072
334-40	534	104,948	105,482
Yukon Territory	<u>0</u>	<u>100</u>	<u>100</u>
TOTAL	288,725	198,671	487,396

Test fishing catches

Ohogamiut = 230

Aerial survey escapement estimates

Andreafsky River = 169,840
Chulinak River 8,265^{2/}
178,105

Estimated number of chums passed tagging area

Number tagged = 6,153
Number unmarked captures = 3,891
Number of recoveries = 23 ^{3/}
Population estimate = $\frac{6,153 (3,891 + 23)}{23} = 1,047,080$

Estimate of escapement above tagging area

Population estimate 1,047,080
Upriver catches - 152,654
Estimated escapement 894,426

Total estimate of Yukon River chum salmon run

Lower river catches 334,742
Test fish catch 230
Aerial survey escapement estimate 178,105
Population estimate 1,047,080

TOTAL ESTIMATE OF SUMMER CHUM SALMON RUN 1,560,157

- ^{1/} Commercial and subsistence catch data are preliminary.
^{2/} Considered a poor survey and represents a minimum figure.
^{3/} Kakamiut tag recoveries only. Includes 3 fish recovered with positive tag loss.

APPENDIX B

Age and sex composition of summer chum salmon catch samples, Yukon River, 1971.

Location	Gear	Age group				Total
		3 ₁	4 ₁	5 ₁	6 ₁	
<u>Males</u>						
Flat Island	G.N.--5 1/2"	2(0.7) ^{1/}	96(34.4)	57(20.4)	--	155(55.6)
	G.N.--8 1/2"	1(0.4)	107(40.5)	80(30.3)	1(0.4)	189(71.6)
Alakanuk	G.N.--5 1/2	1(0.3)	135(39.9)	91(27.0)	--	227(67.2)
	& 8 1/2"					
Ohogamiut	G.N.--5 1/2"	--	1(4.3)	4(17.4)	--	5(21.7)
	Fishwheel	--	39(26.4)	3(2.0)	--	42(28.4)
Kakamiut	Fishwheel	--	37(9.8)	79(20.8)	--	116(30.6)
Nenana	Fishwheel	--	58(31.0)	46(24.6)	--	104(55.6)
Total		4(0.2)	473(29.2)	360(22.3)	1(0.1)	838(51.8)
Percent total--males		(0.5)	(56.4)	(43.0)	(0.1)	(100.0)
<u>Females</u>						
Flat Island	G.N.--5 1/2"	--	70(25.1)	54(19.4)	--	124(44.4)
	G.N.--8 1/2"	--	46(17.4)	29(11.0)	--	75(28.4)
Alakanuk	G.N.--5 1/2	--	73(21.6)	38(11.2)	--	111(32.8)
	& 8 1/2"					
Ohogamiut	G.N.--5 1/2"	--	5(21.8)	13(56.5)	--	18(78.3)
	Fishwheel	3(2.0)	99(66.9)	4(2.7)	--	106(71.6)
Kakamiut	Fishwheel	--	153(40.4)	110(29.0)	--	263(69.4)
Nenana	Fishwheel	1(0.5)	51(27.3)	31(16.6)	--	83(44.4)
Total		4(0.2)	497(30.7)	279(17.2)	--	780(48.2)
Percent total--females		(0.5)	(63.7)	(35.8)	--	(100.0)
<u>Combined sexes</u>						
Flat Island	G.N.--5 1/2"	2(0.7)	166(59.5)	111(39.8)	--	279(100.0)
	G.N.--8 1/2"	1(0.4)	153(57.9)	109(41.3)	1(0.4)	264(100.0)
Alakanuk	G.N.--5 1/2	1(0.3)	208(61.5)	129(38.2)	--	338(100.0)
	& 8 1/2"					
Ohogamiut	G.N.--5 1/2"	--	6(26.1)	17(73.9)	--	23(100.0)
	Fishwheel	3(2.0)	138(93.3)	7(4.7)	--	148(100.0)
Kakamiut	Fishwheel	--	190(50.2)	189(49.8)	--	379(100.0)
Nenana	Fishwheel	1(0.5)	109(58.3)	77(41.2)	--	187(100.0)
Total		8(0.5)	970(59.9)	639(39.5)	1(0.1)	1,618(100.0)

^{1/} (%).

APPENDIX C

Age and sex composition of king salmon commercial and test fishing catch samples, Yukon River, 1971.

Location	Gear	Age group					Total
		3 ₂	4 ₂	5 ₂	6 ₂	7 ₂	
<u>Males</u>							
Flat Island	G.N.--5 1/2 & 8 1/2"	--	9(3.3) ^{1/}	57(21.0)	70(25.7)	2(0.7)	138(50.7)
	G.N.--8 1/2"	--	1(0.5)	61(31.6)	61(31.6)	--	123(63.7)
Alakanuk	G.N.--5 1/2 & 8 1/2"	1(0.1)	5(0.6)	158(20.6)	213(27.8)	6(0.8)	383(49.9)
Ohogamiut	G.N.--8 1/2"	--	9(4.2)	57(26.8)	55(25.8)	--	121(56.8)
Tanana, Rampart	G.N.--5 1/2 & 8 1/2"	--	2(1.6)	29(23.8)	37(30.3)	1(0.8)	69(56.5)
	Fishwheel	--	9(13.3)	36(52.9)	13(19.1)	--	58(85.3)
Nenana	Fishwheel	--	21(20.4)	42(40.8)	7(6.8)	--	70(68.0)
Eagle	Fishwheel	2(0.3)	66(9.4)	273(38.7)	127(18.0)	1(0.1)	469(66.5)
Whitehorse	Fishway	--	1(0.4)	90(33.2)	40(14.7)	1(0.4)	132(48.7)
Total		3(0.1)	123(4.5)	803(29.6)	623(23.0)	11(0.4)	1,563(57.6)
Percent total--males		0.2	7.9	51.4	39.8	0.7	100.0

APPENDIX C (continued)

Age and sex composition of king salmon commercial and test fishing catch samples, Yukon River, 1971.

Location	Gear	Age group					Total
		3 ₂	4 ₂	5 ₂	6 ₂	7 ₂	
<u>Females</u>							
Flat Island	G.N.--5 1/2 & 8 1/2"	--	3(1.1)	17(6.2)	113(41.6)	1(0.4)	134(49.3)
	G.N.--8 1/2"	--	--	12(6.2)	58(30.1)	--	70(36.3)
Alakanuk	G.N.--5 1/2 & 8 1/2"	--	--	46(6.0)	331(43.2)	7(0.9)	384(50.1)
Ohogamiut	G.N.--8 1/2"	--	--	8(3.7)	83(39.0)	1(0.5)	92(43.2)
Tanana, Rampart	G.N.--5 1/2 & 8 1/2"	--	--	5(4.1)	48(39.4)	--	53(43.5)
	Fishwheel	--	--	3(4.4)	7(10.3)	--	10(14.7)
Nenana	Fishwheel	--	--	5(4.8)	28(27.2)	--	33(32.0)
Eagle	Fishwheel	--	--	38(5.4)	196(27.8)	2(0.3)	236(33.5)
Whitehorse	Fishway	--	--	28(10.3)	111(41.0)	--	139(51.3)
Total		--	3(0.1)	162(6.0)	975(35.9)	11(0.4)	1,151(42.4)
Percent total--females		--	0.2	14.1	84.7	1.0	100.0

APPENDIX C (continued)

Age and sex composition of king salmon commercial and test fishing catch samples, Yukon River, 1971.

Location	Gear	Age group					Total
		3 ₂	4 ₂	5 ₂	6 ₂	7 ₂	
<u>Combined sexes</u>							
Flat Island	G.N.--5 1/2 & 8 1/2"	--	12(4.4)	74(27.2)	183(67.3)	3(1.1)	272(100.0)
	G.N.--8 1/2"	--	1(0.5)	73(37.8)	119(61.7)	--	193(100.0)
Alakanuk	G.N.--5 1/2 & 8 1/2"	1(0.1)	5(0.6)	204(26.6)	544(71.0)	13(1.7)	767(100.0)
Ohogamiut	G.N.--8 1/2"	--	9(4.2)	65(30.5)	138(64.8)	1(0.5)	213(100.0)
Tanana, Rampart	G.N.--5 1/2 & 8 1/2"	--	2(1.6)	34(27.9)	85(69.7)	1(0.8)	122(100.0)
	Fishwheel	--	9(13.3)	39(57.3)	20(29.4)	--	68(100.0)
Nenana	Fishwheel	--	21(20.4)	47(45.6)	35(34.0)	--	103(100.0)
Eagle	Fishwheel	2(0.3)	66(9.4)	311(44.1)	323(45.8)	3(0.4)	705(100.0)
Whitehorse	Fishway	--	1(0.4)	118(43.5)	151(55.7)	1(0.4)	271(100.0)
Total		3(0.1)	126(4.6)	965(35.6)	1,598(58.9)	22(0.8)	2,714(100.0)

1/ (%).

APPENDIX D

King salmon fork length conversion table; mid-eye to snout, Yukon River, mile 1,745 (Whitehorse).

Mid-eye to fork length			Mid-eye to fork length		
Male (n=193)	Female (n=177)	Snout to fork length	Male (n=193)	Female (n=177)	Snout to fork length
33.9	35.0	36.0	73.0	77.3	81.0
34.8	36.0	37.0	73.9	78.3	82.0
35.6	37.0	38.0	74.8	79.2	83.6
36.5	37.9	39.0	75.6	80.1	84.0
37.4	38.8	40.0	76.5	81.1	85.0
38.2	39.7	41.0	77.4	82.0	86.0
39.1	40.7	42.0	78.2	83.0	87.0
40.0	41.6	43.0	79.1	83.9	88.0
40.9	42.6	44.0	80.0	84.8	89.0
41.7	43.5	45.0	80.8	85.8	90.0
42.6	44.4	46.0	81.7	86.7	91.0
43.5	45.4	47.0	82.6	87.6	92.0
44.3	46.3	48.0	83.4	88.6	93.0
45.2	47.2	49.0	84.3	89.5	94.0
46.1	48.2	50.0	85.2	90.5	95.0
46.9	49.1	51.0	86.1	91.4	96.0
47.8	50.1	52.0	86.9	92.4	97.0
48.7	51.0	53.0	87.8	93.3	98.0
49.6	52.0	54.0	88.7	94.2	99.0
50.4	52.9	55.0	89.5	95.2	100.0
51.3	53.8	56.0	90.4	96.1	101.0
52.2	54.8	57.0	91.3	97.0	102.0
53.0	55.7	58.0	92.2	98.0	103.0
53.9	56.6	59.0	93.0	98.9	104.0
54.8	57.6	60.0	93.9	99.9	105.0
55.6	58.5	61.0	94.8	100.8	106.0
56.5	59.5	62.0	95.6	101.7	107.0
57.4	60.4	63.0	96.5	102.7	108.0
58.2	61.3	64.0	97.4	103.6	109.0
59.1	62.3	65.0	98.2	104.6	110.0
60.0	63.2	66.0	99.1	105.5	111.0
60.8	64.2	67.0	100.0	106.4	112.0
61.7	65.1	68.0	100.8	107.4	113.0
62.6	66.0	69.0	101.7	108.3	114.0
63.5	67.0	70.0	102.6	109.3	115.0
64.3	67.9	71.0	103.4	110.2	116.0
65.2	68.9	72.0	104.3	111.1	117.0
66.1	69.8	73.0	105.2	112.1	118.0
66.9	70.7	74.0	106.1	113.0	119.0
67.8	71.7	75.0	106.9	114.0	120.0
68.7	72.6	76.6	107.8	114.9	121.0
69.5	73.6	77.0	108.7	115.8	122.0
70.4	74.5	78.0	109.5	116.8	123.0
71.3	75.4	79.0	110.4	117.7	124.0
72.2	76.4	80.0	111.3	118.6	125.0

APPENDIX E

Daily king salmon escapement counts, Whitehorse Dam fishway, Yukon River,
1971.

Date	Daily count	Cumulative total
8/ 7	3	3
8	2	5
9	2	7
10	3	10
11	17	27
12	9	36
13	24	60
14	27	87
15	40	127
16	68	195
17	92	287
18	71	358
19	89	447
20	46	493
21	41	534
22	73	607
23	36	643
24	40	683
25	44	727
26	35	762
27	26	788
28	24	812
29	23	835
30	6	841
31	1	842
9/ 1	7	849
2	6	855
3	1	856
4	Gate opened	856 Total

APPENDIX F

Summary of Yukon River drainage king salmon escapement estimates in index areas, 1959-1971.^{1/}

Year	Andreafsky R.		Anvik R.	Salcha R.	Big Salmon R. ^{2/}	Nisutlin R. ^{3/}	Whitehorse Dam fishway
	West fork	East fork					
1959	-	-	-	-	-	-	1,054
1960	1,220	1,020	1,950	1,660	-	-	660
1961	-	1,003	1,226	2,878	-	-	1,068
1962	762 ^{4/}	675 ^{4/}	-	937	-	-	1,500
1963	-	-	-	-	-	-	484
1964	705	867	-	450	-	-	587
1965	355 ^{4/}	-	650 ^{4/}	408	-	-	903
1966	303	361	638	800	-	-	563
1967	276 ^{4/}	-	336 ^{4/}	-	-	-	533
1968	383	380	297 ^{4/}	735	300-400	407	407
1969	274 ^{4/}	231 ^{4/}	296 ^{4/}	461 ^{4/}	286	105	334
1970	574 ^{4/}	665	368 ^{4/}	1,882	670	615	625 ^{6/}
1971	1,284	1,904	-	158 ^{4/}	200 ^{5/}	540 ^{5/}	856

^{1/} With exception of Whitehorse fishway counts, data obtained from aerial surveys.

^{2/} Quiet Lake to Scurvy Creek.

^{3/} Sidney Creek to Hundred Mile Creek.

^{4/} Incomplete survey or poor survey conditions resulting in a very minimal estimate.

^{5/} Canadian Dept. of Fisheries survey.

^{6/} Counts prior to 1970 conducted by local sportsman group on a volunteer basis. Late counts made by Fisheries personnel.

APPENDIX G

King and summer chum salmon test fishing catches, Flat Island, Yukon River, 1971.

Date	Gill net--8 1/2 ^{1/}			Gill net--5 1/2 ^{2/}		
	Effort (hours)	King	Chum	Effort (hours)	King	Chum
6/13	2	1	0	-	-	-
14	30	8	1	-	-	-
15	48	14	1	-	-	-
16	35	31	12	-	-	-
17	48	14	10	-	-	-
18	48	6	13	-	-	-
19	48	31	13	6	0	10
20	48	57	11	24	0	22
21	48	65	12	24	11	14
22	48	20	7	24	0	1
23	38	7	2	24	0	4
24	48	67	45	24	3	17
25	48	72	122	24	2	150
26	45	34	15	24	0	18
27	48	62	28	24	2	5
28	48	72	46	-	-	-
29	-	-	-	-	-	-
30	96	204	178	-	-	-
7/ 1	48	15	42	8	0	0
2	48	0	1	24	1	4
3	48	12	5	24	0	4
4	48	54	52	24	9	45
5	48	12	12	24	2	38
6	48	21	24	24	5	71
7	48	46	32	24	5	111
8	48	42	63	24	3	67
9	48	48	64	24	4	33
10	48	138	154	24	16	168
11	19	43	97	-	-	-
12	-	-	-	48	4	137
13	125	35	74	-	-	-
14	24	7	27	-	-	-
15	18	2	25	-	-	-
Totals	1,440	1,240	1,188	470	67	919

1/ Two 25 fathom set gill nets, site #1 and #2.2/ One 25 fathom set gill net, site #3.

APPENDIX H
Chum salmon catch data, Ohogamiut, Yukon River, 1971

Fishwheel								
Date	effort (hours)	Summer chums			Fall chums		Total Catch	Recoveries
		Tagged	Untagged	Total	Tagged	Untagged		
6/22	24	1	0	1	-	-	1	0
23	24	2	0	2	-	-	2	0
24	24	1	0	1	-	-	1	0
25	24	1	0	1	-	-	1	0
26	24	11	0	11	-	-	11	0
27	24	6	1	7	-	-	7	2
28	24	6	1	7	-	-	7	1
29	24	0	0	0	-	-	0	0
30	24	21	0	21	-	-	21	3
7/ 1	24	17	0	17	-	-	17	1
2	24	40	2	42	-	-	42	1
3	24	59	1	60	-	-	60	3
4	24	145	5	150	-	-	150	7
5	24	287	16	303	-	-	303	4
6	24	99	3	102	-	-	102	2
7	24	95	4	99	-	-	99	2
8	24	100	3	103	-	-	103	2
9	24	82	2	84	-	-	84	0
10	24	125	6	131	-	-	131	5
11	24	124	3	127	-	-	127	2
12	24	316	6	322	-	-	322	7
13	12	128	4	132	-	-	132	3
14	24	439	3	442	-	-	442	5
15	24	585	34	619	-	-	619	13
16	24	729	8	737	-	-	737	8
17	24	1,068	8	1,076	-	-	1,076	18
18	20	490	76	566	-	-	566	8
19	24	246	5	251	-	-	251	5
20	23	118	25	143	-	-	143	1
21	24	231	3	234	-	-	234	6
22	24	115	4	119	-	-	119	2
23	24	71	0	71	-	-	71	3
24	24	77	0	77	-	-	77	6
25	24	30	0	30	-	-	30	2
26	24	40	1	41	-	-	41	0
27	24	64	0	64	16	0	80	5
28	24	41	0	41	19	0	60	2
29	24	31	1	32	24	0	56	3
30	24	21	0	21	7	0	28	1
31	24	13	0	13	0	0	13	0
8/ 1	24	11	1	12	5	0	17	0
2	24	19	0	19	33	0	52	3
3	24	16	0	16	35	0	51	0
4	24	24	2	26	16	0	42	1

APPENDIX H (continued)

Chum salmon catch data, Ohogamiut, Yukon River, 1971.

Date	Fishwheel effort (hours)	Summer chums			Fall chums		Total Catch	Recoveries
		Tagged	Untagged	Total	Tagged	Untagged		
8/ 5	24	0	0	0	41	0	41	1
6	24	2	1	3	56	0	59	4
7	24	2	0	2	71	0	73	1
8	24	0	0	0	61	0	61	3
9	24	2	1	3	26	0	29	1
10	24	1	0	1	11	0	12	0
11	24	0	0	0	13	0	13	0
12	24	1	0	1	32	0	33	0
13	12	0	0	0	19	0	19	1
Totals	1,243	6,153	230	6,383	485	0	6,868	148

APPENDIX J

King salmon gill net catch data, Ohogamiut, Yukon River, 1971.^{1/}

Date	Effort (hours)	Total catch
6/16	24	1
17	24	2
18	24	9
19	24	1
20	24	2
21	24	1
22	24	0
23	24	0
24	24	1
25	24	3
26	24	3
27	24	5
28	24	4
29	24	6
30	24	3
7/ 1	24	4
2	24	3
3	24	7
4	24	5
5	24	4
6	24	2
7	24	1
8	24	4
9	24	5
10	24	2
11	24	3
12	24	2
13	24	1
14	24	0
15	24	1
16	24	1
17	24	1
18	24	3
19	24	1
20	24	0
21	24	3
22	24	1
23	24	2
24	24	2
25	24	1
26	24	1
27	24	2
Totals	1,008	103

^{1/} Commercial and test fish catch.

APPENDIX K

Summary of subsistence harvest data, Yukon River, 1961-1971.^{1/}

Year	Total catch	
	King salmon	Other salmon ^{2/}
1961	23,719	407,814
1962	19,910	358,441
1963	32,656	421,625
1964	22,817	485,630
1965	19,723	458,379
1966	14,017	214,236
1967	19,661	288,595
1968	14,832	189,607
1969	14,946	213,725
1970	15,926	223,237
1971 ^{3/}	24,916	198,671

^{1/} Regnart et al, 1971.

^{2/} Mostiy chum salmon, some pink and cohos.

^{3/} Data are preliminary.